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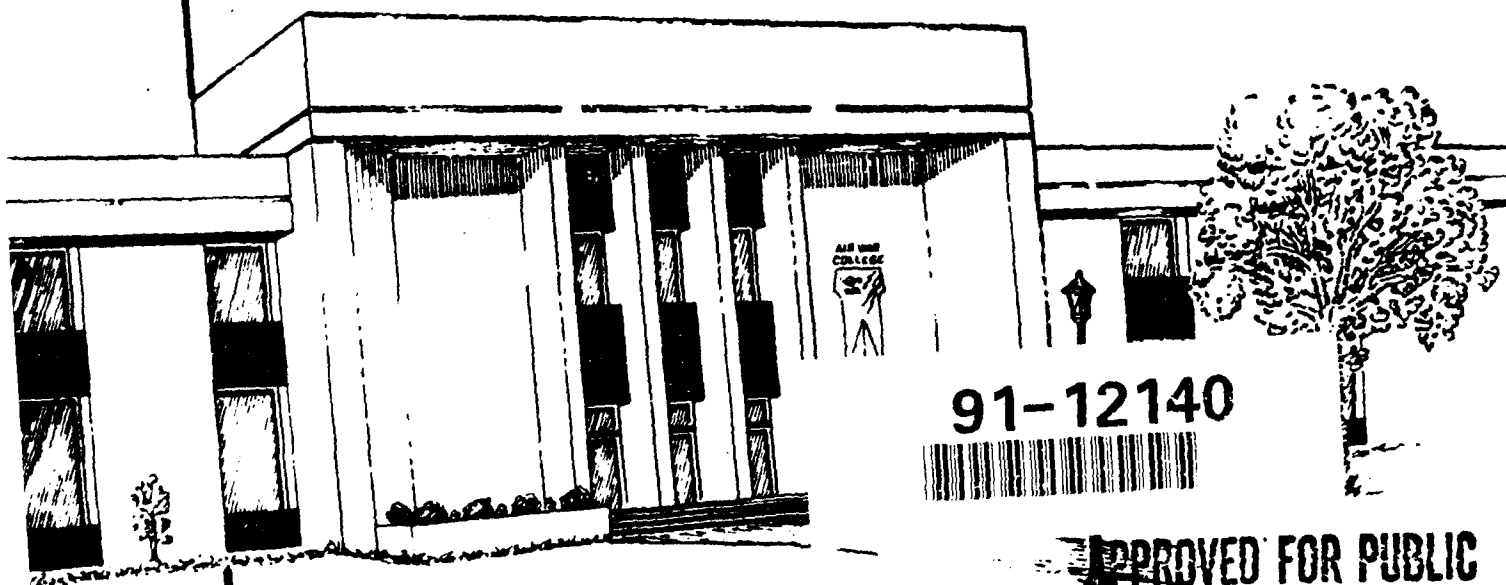
RESEARCH REPORT

FOLLOW-ON FORCE ATTACK--NOW AND IN THE FUTURE

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UNITED STATES AIR FORCE
MAXWELL AIR FORCE BASE, ALABAMA

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FOLLOW-ON FORCE ATTACK -- NOW AND IN THE FUTURE

by
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A DEFENSE ANALYTICAL STUDY SUBMITTED TO THE FACULTY
IN
FULFILLMENT OF THE CURRICULUM REQUIREMENT

Advisor: Colonel George P. Gaines, IV

MAXWELL AIR FORCE BASE, ALABAMA
April 1990



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EXECUTIVE SUMMARY

TITLE: Follow-on Force Attack (FOFA): Now and in the Future.

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Soviet military doctrine calls for the use of echeloning to penetrate prepared defenses. FOFA counters this strategy by reducing the combat power of the follow-on forces to produce manageable force ratios at the in-contact battle. The FOFA concept offers a framework within which to employ new technology systems to locate, delay, disrupt and destroy targets in the enemy rear. From inception, FOFA has been controversial but since its formal adoption in 1986 the rationale for the concept has strengthened. Doubts about affordability and technical feasibility have been largely dispelled. The introduction of the operational maneuver group and possible countermeasures by the Soviets have diluted but not invalidated the effectiveness of the concept. There is substance in European concerns that most of the critical sub-systems are American and expensive but initiatives to involve the European nations in the manufacture and operation of FOFA systems continue. Troop reductions in Europe will increase the need for FOFA: its high technology and effectiveness are the best substitutes for fewer men. FOFA is not overaggressive nor inconsistent with NATO's defensive nature: the concept is simply a better way of doing what it has always been planned to do. FOFA is unique. The concept provides a lead in coordinating the design, manufacture and operation of the weapon systems which inevitably will result from new technology. FOFA is a key element of SACEUR's plans for the defense of Europe now and in the future.

BIOGRAPHICAL SKETCH

Wing Commander AVB Hawken has a long interest in the effectiveness of air to ground weapons. He is a graduate of the Royal Air Force Weapons Employment School and has served as a qualified weapons instructor on 3 aircraft types: Hunter, Hawk and Phantom. He was awarded the Air Force Cross and a Queen's Commendation for Valuable Service in the Air in recognition of work connected with improving the effectiveness of air to ground weaponry. His staff tours include a post in the Operational Requirements Division of the Ministry of Defence as a desk officer for air to ground weapons. In his previous appointment he commanded the Tornado Weapons Conversion Unit. Wing Commander Hawken is a graduate of the Royal Air Force Advanced Staff Course and the Air War College Class of 1990.

INTRODUCTION

1. An attack by the Warsaw Pact (WP) in the Central Region (CR) of the North Atlantic Treaty Organization (NATO) would be difficult to defeat. German public opinion and a lack of geographical depth preclude a policy of trading space for time. The enemy would enjoy numerical superiority in armor and fire power as well as the advantage of the strategic offensive. On several occasions at the turn of the last decade former Supreme Allied Commander Europe (SACEUR), General Bernard Rogers, warned, that were the WP to attack, it might be only days before he had to ask for the release of nuclear weapons.¹ Doubts that NATO's political leaders could agree such a course in time undermined the credibility of NATO's deterrence. NATO therefore decided to improve its conventional forces.² The attack of the WP's follow-on forces (FOFA) is a major element of this initiative. The purpose of FOFA is to delay, disrupt and weaken WP forces before they engage NATO's ground defenses, and thus produce more favorable odds for NATO's armies. From inception FOFA has been controversial.

2. This paper examines the progress towards implementing FOFA since its formal promulgation in 1985, the main areas of controversy and the FOFA's prospects in the future. The paper starts by looking at the origins of the concept and its relationship to Soviet military doctrine. It next investigates the critical aspects of the concept. To be

effective FOFA requires a synergism of emerging technologies and there are doubts about affordability and technical feasibility.³ The essential elements of the FOFA concept are detailed and progress towards implementation examined. It is assessed, despite defense cutbacks, that a viable system will be fielded. The paper next looks at the contention that changes in Soviet tactics have undermined the concept.⁴ In particular the impact of the operational maneuver group (OMG) is investigated and judged to dilute, but not invalidate, the potency of FOFA. At least one commentator doubts that FOFA contributes to deterrence⁵ and the paper in examining this area concludes this is a false contention. There is also apprehension about the effectiveness of FOFA in the light of probable WP countermeasures.⁶ Some degradation in system effectiveness is inevitable but, provided systems have resistance to countermeasures built in, FOFA should remain a highly capable concept. The paper then goes on to refute or suggest ways around the major European concerns about FOFA.⁷ It judges, despite some European views to the contrary, FOFA is not overaggressive nor inconsistent with NATO's defensive nature but there is substance in the argument that most of the essential equipment needed to effect the concept is American and expensive. Lastly, the paper examines the effect of troop reductions in Europe on the continuing validity of FOFA. Overall, it concludes that the future for FOFA is not secure and there remain impediments to full implementation. Nevertheless, the FOFA concept is sound and

it is probable that sufficient elements of the necessary systems will be fielded to make the concept viable. Even at reduced effectiveness, FOFA will make an important contribution to the defense of Central Region of NATO.

THE DEVELOPMENT OF THE FOFA CONCEPT

3. Since the late 1930s the Soviet Army has had as its offensive doctrine a concept of "deep operations". It is defined in the Soviet Military Encyclopedia as:

The simultaneous suppression of the enemy defense by attrition throughout its whole depth, by breaking through the tactical zone of defense on selected axes, with subsequent rapid development of tactical success into operational success by committing to the engagement exploitation echelons and by air assault landing for the most rapid attainment of the objective.

Prior to the 1980s the Warsaw Pact's concept for an attack in Europe envisaged using its superiority in men and armor to swamp NATO defenses. The Soviets planned an echeloned assault with successive waves being employed, first, to break-through and, then, exploit the hole in the defenses. The concept has been likened to "bursting a dam by exerting great pressure and a subsequent torrent that carries all before it. It succeeds by the momentum of the torrent."

4. This emphasis on mass and firepower was consistent with the then available Soviet force structure. NATO recognized that while the first echelon might be stopped there was scant hope of defeating the reinforcing echelons. However, the very force structure necessary for this concept to be

successful made it vulnerable. To create the required sustained pressure on the NATO frontline, the so-called "follow-on forces" had to be positioned immediately behind the leading wave to be ready to assist in achieving, or exploiting, the break-through. Inevitably, these follow-on forces would be on, or close to, lines of communication and the need to be ready to move forward rapidly dictated that they could not be widely dispersed. Moreover, Soviet doctrine stressed that such operations be tied to a rigid timetable. This would lead to concentrations of troops and equipment which would be vulnerable to attack. If these follow-on forces could be destroyed, disrupted or delayed, the pressure on NATO's general defense positions would reduce, thus, increasing the chance of holding a WP attack.

5. Towards the end of the 1970s and in the early 1980s emerging technologies offered the possibility of developing potent weapons systems which would greatly enhance NATO's ability to interdict the WP rear. This opportunity was recognized by NATO and FOFA became official policy in November 1985. General Rogers, Supreme Allied Commander Europe, described FOFA as:

-- a sub-concept of a concept. It is intended to improve our conventional firepower. It is by no means a new strategy; instead it serves to employ the strategy we already have more effectively."¹⁰

FOFA has the aim of greatly enhancing NATO's ability to detect, identify, target and attack the WP second and third echelons behind the forward edge of the battle area (FEBA)

before they are committed to combat. The innovative aspect of the concept is its integrated nature with the option of employing either air or land systems or, indeed, a combination of both. At the time of the promulgation of the FOFA, NATO had an interdiction capability, but, its effectiveness was limited. By day choke points and fixed installations such as bridges could be held at risk but at night and in bad weather NATO's capability was poor. Thus, existing systems could not meet the requirement. The full potential of the concept could only be met with the development and deployment of new systems employing advanced technology. The concept did not attempt to dictate ownership of the systems; rather it stated a broad operational problem and sought solutions. It recognized that the attack of follow-on forces is a complex problem involving multiple and sometimes over-lapping tasks. These tasks include: detection of targets; classification of targets by type and likely employment; selection of the time and place to attack; and, where there would be a significant delay in the weapons reaching targets, provision of an update on target position and orientation. Emerging technologies offer solutions to all of these problems and enhancements in other areas.¹¹ Improvements include accurate long-range weapon systems with 24 hour all-weather effectiveness and much improved terminal lethality for weapons and sub-munitions. Some systems which promise to contribute to FOFA have capabilities in more than one functional area but, for ease of reference, the sub-systems are discussed under the following headings: surveillance and reconnaissance; intelligence fusion and targeting; weapon delivery systems and weapon terminal effectiveness.

SURVEILLANCE AND RECONNAISSANCE

6. Strategic systems for the surveillance of the WP rear area already exist in the form of US reconnaissance satellites and the advanced synthetic aperture radar on the TR-1. These systems, however, cannot provide the precise and timely information necessary to direct FOFA attacks although they should identify the main Soviet thrusts.¹² The location and identification of targets out to 50 km is an area in which NATO has some capability and there are several complementary development projects. The UK airborne stand-off radar (ASTOR) program and the French observatoire radar coherent heliporte d'investigation des elements ennemis (ORCHIDEE) battlefield surveillance radar offer some additional capacity to existing US systems. Moreover, this section of the battlefield can be covered by remotely piloted vehicles and the US advanced tactical air reconnaissance system (ATARS) promises to bring a major improvement to this area.¹³ However, the key reconnaissance project is the joint surveillance target attack system (JSTARS) which offers the possibility of accurate real-time information on enemy dispositions.¹⁴ This system employs sophisticated synthetic aperture radar down-linked to ground stations and is the only resource able to provide the timely accurate targeting information over a large area needed for FOFA to be fully effective. JSTARS should give good coverage well into the enemy rear. Unclassified sources suggest at least 150 km, but, clearly, foliage and terrain will restrict capability. Nevertheless, JSTARS is acknowledged to be to the battlefield what the E-3A was to air defense - a

major advance in surveillance and tracking capability and fundamental to future battlefield management.¹⁵ Critics of the project cite the vulnerability of the system currently to be mounted on an airline platform such as the 707, however, it should be capable of operating effectively well back from WP airspace and, thus, give a measure of insurance against successful WP attack. JSTARS is fully funded and enjoys strong Department of Defense (DOD) support. Currently in full scale development, JSTARS should enter combined development and operational testing in 1991, leading to limited operational capability in 1995.¹⁶

INTELLIGENCE FUSION AND TARGETING

7. JSTARS and other systems should provide an accurate picture of the WP deployments, but it is still necessary to evaluate the data and decide which targets to hit and with what weapon systems and when. This is a classic command, control, communication and intelligence (C³I) problem and another most difficult functional area. The US joint tactical fusion program (JTTF) should make a major contribution to providing a solution to the C³I area.¹⁷ The JTTF has separate systems under development for the US Army and the United States Air Force (USAF) but they share many common components and promise high speed handling of intelligence data and selection of time critical targets. Secure information dissemination systems such as joint tactical information distribution systems (JTIDS) are becoming increasingly available to pass on targeting orders. For FOFA to be fully effective, it will also be necessary to

develop a close interface between the ground and air commanders to select the weapon system to be used to attack targets. Modern communications and information handling systems are available to effect this vital liaison function but the decision making process is a possible weak link in the FOFA concept. Work is in hand, both in the US and NATO, to develop the systems and procedures. It may be necessary to delegate the authority to engage targets to a lower level than in the past to ensure timely decisions. It will require revised procedures and attitudes. For example, the tasking cycle for tactical aircraft will have to be radically shortened.¹⁸ It may be necessary to pre-allocate tactical aircraft to FOFA in anticipation of target availability. This would be against the normal maxim of the flexible employment of air power but the likely plethora of targets and the effect on Soviet capability could justify such a policy. Commanders will have to anticipate when the Soviets will be in vulnerable target arrays, for example as they approach choke points or close up because of attacks on the leading elements of formations. JSTARS will provide a groundplot which allows such judgements. Indeed, the JSTARS information may have to be treated like an air defense airpicture and FOFA firepower assets "scrambled" or diverted from other tasks to engage enemy concentrations while they are exposed.¹⁹ One requirement does stand out and that is the need for a joint approach between ground and air commanders. This is necessary both to ensure that proper advice is exchanged and to allocate the optimum weapon system to targets. This strongly suggests that FOFA command elements, whether ground or air, should be collocated.

8. Thus, the technology to provide the necessary rapid evaluation of intelligence should be available but procedures to allocate weapons systems to target arrays need further development.²⁰

WEAPON DELIVERY SYSTEMS

9. A wide variety of weapon delivery systems, suitable for integration into the FOFA concept, already exist or are under development. At the short end of the range scale, conventional artillery can be used to deliver munitions well behind the forward edge of the battle area (FEBA) while such weapons as the multi launch rocket system (MLRS) offers greater range and kill potential.²¹ Manned aircraft also have a major role to play and can be used against difficult-to-destroy small hard targets such as bridges. Moreover, increasing numbers of aircraft will be equipped for night attack with forward looking infra-red (FLIR) and night vision goggles (NVG).²² However, it is inevitable that there will be a delay between tasking aircraft and arrival at their targets and, thus, it will be necessary to provide them with an update of target position and layout. The JSTARS program includes the facility to do this automatically in real time. Not all aircraft will have this but this should be, at least partially and more probably almost completely, compensated for by updates by secure voice.²³ Further, the target cueing inherent in FLIR should also help by reducing the need for precise target locations and conferring an element of autonomy to interdicting

aircraft. FLIR aircraft should be able to be targeted into a general target area with a high probability that they will find their target and attack it on the first pass.²⁴ The US Army is developing the army tactical missile system (A-TACMS) which has the potential to hit concentrations well into the enemy rear. It will be updated in flight on target position and orientation. It promises to be highly effective. Thus, the weapon delivery systems needed to effect FOFA should be available.

WEAPON TERMINAL EFFECTIVENESS

10. For FOFA to be fully effective the munitions employed must have high lethality against their target arrays. Smart bombs will retain utility to destroy "hard" targets and general purpose bombs and other area munitions will continue to be useful against "soft" support facilities. However, traditional artillery and bombs offer relatively low kill capability against armor.²⁵ To provide the required high effectiveness against such targets the employment of new technology is essential. Mines offer one approach and there are several systems on offer²⁶ but the most promising development area is the use of infra-red and millimetric spectrums to guide sub-munitions to armor.²⁷ Not all the problems with such weapons have yet been solved but the technology in these areas is relatively mature and there is little doubt that affordable solutions will be available in the near future.²⁸

NEW WP TACTICS

11. The early 1980s saw a change in the way the WP intended to achieve and exploit the break-through. Instead of brute force, the WWII concept of "mobile groups" was re-adopted and renamed "operational maneuver groups"(OMG).²⁹ These groups are small combined-arms formations, typically brigade size, capable of independent operation for a number of days.³⁰ They are highly mobile. The intention is to "flow around" strong points to reach NATO's rear and hit soft targets, of tactical size but strategic importance, such as nuclear delivery systems, headquarters and their associated C3I facilities, airfields, and logistic dumps.³¹

12. It has been suggested that this new doctrine invalidates the FOFA concept.³² Soviet writings state that echeloning can be unnecessary when using OMGs.³³ This contention is invalid and not consistent with historical precedent nor the reality of operation against NATO in the CR. First, in WWII the Soviets found that to break through against prepared German defenses it was always necessary to mass firepower and mechanized infantry.³⁴ Once the break through was achieved mobile groups attempted to reach the German rear areas. To counter this tactic the Germans prepared secondary and tertiary defense lines which they manned only when the primary lines had been breached. The Soviets then had to mount another deliberate attack employing echeloning. The Soviets do not discard such lessons easily. NATO plans to employ similar tactics and given the likely density and depth of defenses, it is difficult to see how the WP will

break through without mounting a deliberate attack involving echeloning. Second, the terrain in Central Europe would channelize a WP attack.³⁵ The logistic requirements of a modern army dictate the use of major roads or railways. There are a limited number of east/west roads which could support a Soviet attack and each of these can only support the deployment of a limited number of combat formations in line abreast. The remainder, along with the logistic support, would be out of contact deployed on or near the roads and be vulnerable to interdiction.³⁶ Thus, it is inevitable that there will be FOFA targets. Indeed, if there are not the NATO GDP forces should prevail.³⁷ JSTARS will be able to recognize forces configured as OMGs³⁸ and while these are waiting to be committed they will be prime FOFA targets. Another argument cites the fact that the OMG concept inevitably involves considerable intermingling of WP and NATO forces and this makes FOFA attacks inappropriate.³⁹ This apparently valid contention forgets that FOFA targets follow-on forces before they become engaged. This means WP and NATO forces will not be intermingled and, accordingly, there is no risk of fratricide from FOFA. Thus, new Soviet tactics do not undermine the FOFA concept.

FOFA AS A DETERRENT

13. A number of writers have suggested that FOFA does not contribute to deterrence. Lt Col Peters⁴⁰ writing in the Royal United Services Institute Journal evaluates FOFA against a number of possible scenarios for a WP attack. He

covers three types of attack: blitzkrieg (OMG); attrition; and mixed (a combination of blitzkrieg and attrition) with either a "standing start" or reinforced from the Soviet Union with aims that vary from European conquest to limited geographical or political objectives. He concludes that either the WP is unlikely to undertake a type of attack because it has little chance of success or, in the possible attack scenarios, that FOFA does not deter. He states:

..because FOFA draws away combat power from the FEBA, FOFA has the effect of making the reinforcement of GSFG (Group of Soviet Forces Germany) or mobilization less necessary. The redirection of NATO combat power away from the FEBA helps to create force ratios at the FEBA more favorable to the GSFG.

This is Peters' first fallacy and is typical of the arguments advanced against FOFA. While it is true that FOFA could draw some combat power and investment away from GDP forces, the very intention of FOFA is to create more favorable ratios at the FEBA by attriting the WP forces before they reach the FEBA. Moreover, the nature of FOFA is such that it does not necessarily divert forces from the GDP; rather it employs weapon systems such as indigenous artillery and air power more effectively. Admittedly some systems such as A-TACMS will be almost exclusively dedicated to the FOFA role but almost all of the other systems such as JSTARS, IFCs and tactical aircraft have independent utility or could be used to enhance FEBA defense if necessary. Peters also contends that FOFA facilitates Soviet "standing start" attack plans. In this event, he concedes that some deep-attack targets will be available but opines:

--they are less likely to have an important impact on the operations' overall success. They still divert NATO's limited combat power away from the FEBA, where successful defense is likely to be very difficult with NATO forces surprised and, thus, not fully deployed or prepared in their GDP.

This ignores the reality of the situation. It is most unlikely that NATO will be caught without any warning at all. The critical elements of FOFA, JSTARS and the IFCs, will be in place and operational. In order to advance rapidly the Soviets will have to use east/west roads and autobahns as their major axes of attack. It is inevitable that there will be natural echeloning and, also, in preparation to exploit a break-through, deliberate echeloning. In such circumstances the responsive nature of FOFA will be of great import. FOFA offers the potential to destroy and delay the advancing forces giving time for the GDP defense to deploy and also reduce the weight and momentum of attack at the FEBA. Indeed, far from finding it difficult to envisage a situation where FOFA will make a contribution to deterrence, as concluded by Peters, it is difficult to envisage a situation where FOFA will not be a deterrent. Put another way, behind the FEBA, there will always be WP forces moving forward, holding or deploying for assault. They will be vulnerable to attack by FOFA systems and the Soviets will have to take into account the probable substantial attrition. FOFA, therefore, deters.

WP REACTION TO FOFA

14. Soviet military writers refer to FOFA-like systems as "reconnaissance-strike complexes" (RUKs) and considerable

concern has been voiced about how to counter such systems in their open press. Indeed, the depth of the concern may have prompted General Secretary Gorbachev's call in January 1988 to halt the development of all "non-nuclear" weapons.⁴¹

15. The Soviets are likely to react to FOFA in a number of ways.⁴² First, they will probably modify their tactics and forces to make them less vulnerable to RUK attack. We will presumably see assembly areas further back and the approach march dispersed rather more. Nevertheless, it is inevitable that bunching will occur at choke points and when the units concentrate for the assault. These will be good opportunities for attack. There are a wide range of possible countermeasures to the various elements of the FOFA system. The Soviets could well deploy radar reflectors to fool JSTARS and use infra-red and millimetric decoys to draw off weapons. Counter countermeasures are available to many of these threats and it is axiomatic that the various sub-systems should be resistant to the more obvious Soviet reactions and have a degree of redundancy built in. A second likely WP direct response is to develop the capability to locate and attack, perhaps preemptively, the components of the RUK. The two most critical components are the airborne JSTARS platform and the IFCs. Thus, it is important that JSTARS be effective when operating well back from the FEBA and, therefore, give time and space to employ active and passive measures to protect the aircraft. Similarly, consideration must be given to either hardening the IFCs or ensuring that they do not have an easily discernable signature. A third WP response advocated in the Soviet

military press is to develop their own RUK - this seems to be unlikely to reach fruition given NATO's forward defense posture which does not invite FOFA-like attack. Lastly, the Soviets might seek to foster the notion that FOFA is an aggressive concept and, as such, inconsistent with NATO's defensive nature and be abandoned.

THE EUROPEAN ATTITUDE TO FOFA

16. In general, in addition to the inevitable concerns over cost, the European members of NATO have two major reservations about FOFA. The first is that FOFA is an aggressive concept which is incompatible with NATO's status as a defensive alliance.⁴³ This perception has convoluted roots but appears to have developed out of a misunderstanding of the nature of FOFA and its relationship to the US Army's AirLand Battle doctrine.⁴⁴ There is common ground, but the criticisms read across the AirLand Battle's emphasis on maneuver, particularly the need to attack the enemy's rear and use of integrated firepower possibly including chemical and nuclear weapons, to FOFA. This link has been interpreted to mean that, in adopting FOFA, NATO now intends to attack across WP borders and also to use weapons of mass destruction, not as weapons of last resort, but as part of an integrated fire plan. If FOFA did contain such provision, this would be a legitimate criticism for it is completely counter to agreed policy. Indeed, the 1986 version of FM 100-5, the AirLand Battle manual, attempts to clear up these points of contention.⁴⁵ The revised manual stresses that decisions to cross international borders and

to use weapons of mass destruction are the prerogative of governments and not the military. Moreover, General Rogers reiterated that it remained NATO policy not to strike the first blow, nor to violate the borders of the WP and only to use nuclear weapons in the most extreme circumstances.⁴⁶ NATO has, however, always intended to prosecute a vigorous defence which includes counterattack and the air interdiction of the enemy's rear. This policy preceded FOFA and the adoption of the new concept has not changed the nature of the alliance nor made it more aggressive.

17. The second major reservation is that the European nations will have to buy US equipment to contribute to FOFA. All of the critical sub-systems are American or of a sufficiently complex advanced nature to make them either too expensive to develop even as collaborative ventures or place them beyond the current European technical base.⁴⁷ Thus, some see FOFA as an attempt to sell yet more US equipment and, given the imbalance of the "two way street" in America's favor, this is an unwelcome aspect of FOFA. There is also a perception that the information from the reconnaissance systems and intelligence fusion centers (IFCs) would be treated as a US national asset and only released grudgingly to the allies.⁴⁸ A number of solutions to these last 2 dilemmas are possible. One way forward would be to form NATO units to operate critical elements of the system along the lines of the AWACS program with joint funding and operation of systems: JSTARS is an obvious candidate for such an approach. However, despite the attraction of this scheme, to date, it appears to have found

little favor. The Europeans are apparently concerned about the cost of such a venture and that it might be funded at the expense of the infra-structure scheme as happened with the AWACS project. Nevertheless, a joint JSTARS has such merit that it is an idea which warrants further consideration and US advocacy. An additional approach is to get the European nations to develop those elements of the concept which are within their manufacturing capability. This might be on a complete sub-system, or more likely a component basis. Indeed initiatives along these lines are already underway: the collaborative development of terminally guided sub-munitions for MLRS is one example of a successful program. These ideas and initiatives are worthy of further study and encouragement for it would be beneficial to foster a sense and a reality of direct European involvement in FOFA.

ARMS REDUCTION AND FOFA

18. The pace of change in the Soviet Union and the East European countries is such that it is difficult to predict the outcome and the nature of the eventual political make-up of those countries currently in the WP. However, it is inevitable that there will be a reduction, in both the eastern and western blocs, of the perception of the immediate threat from the other. Moreover, provided that Gorbachev continues in power and "new thinking" remains extant, it appears inevitable there will be conventional arms reductions in Europe. Accordingly, it is necessary to assess the validity of FOFA in the context of a NATO with a

smaller standing force. At first sight, under such circumstances, it might appear that the alliance should concentrate its efforts in GDP forces to compensate for the loss of combat power at the FEBA. However, to lower tension and give confidence that a surprise attack will not be mounted, it is likely that there will be a drawing back from the Inner German Border (IGB), perhaps by some distance. Indeed, it now seems inevitable that major elements of US, UK and the other forward-stationed troops will be repatriated. This could mean far fewer troops in-place in the CR. This disposition would put a premium on the fighting power of the remaining in-place forces. High technology is the best substitute for the lack of the men on the ground. In this new circumstance, FOFA would have a major role to play. First, reconnaissance elements of the system would act as a major confidence builder in peacetime and reduce the need for verification on the ground. The same sub-system would give excellent intelligence during any period of tension and aid the positioning of the NATO defenses. Should hostilities breakout, FOFA would make a major contribution. The WP would have reduced forces available and they would be attempting to break-through a slimmer but well-equipped NATO. To penetrate the high technology defenses it is most probable that the WP will have to echelon its attack. This will create the optimum conditions for FOFA's force-multiplying characteristics to be brought into play. Thus, the FOFA concept would remain valid following force reductions and in the new scenario FOFA's systems contribution to deterrence and war fighting capability would be proportionally greater.

CONCLUSION

19. FOFA is an innovative concept which should make a major contribution both to the defense of Central Europe and as a deterrent to WP attack. To be effective, FOFA requires the deployment of high technology systems which exploit recent advances in microchip, microprocessor, sensor and guidance techniques. A synthesis of these technologies now make it possible to find and classify in near real-time mobile targets well into the enemy rear and to attack them, even if they are moving, with high lethality. This should help to produce force ratios at the FEBA which NATO's ground force can defeat. Despite the promise of FOFA many impediments remain to its complete implementation. Indeed, in the light of the developments in Eastern Europe and the demands for a peace dividend, it now seems unlikely that FOFA will be deployed as originally conceived. Nevertheless, even in a diluted form, FOFA has much to offer to the security of Europe. First, its reconnaissance elements, particularly JSTARS, will give confidence that a Soviet attack is not imminent. Second, should an attack be developing, JSTARS will give the ability to predict the main axes of the attack and assist in the optimum deployment of NATO's defenses. Third, in the event of an attack, FOFA systems offer the capability to prevent the follow-on forces from being effectively employed and thus give a greater probability that NATO's GDP forces will prevail. The contribution of JSTARS and the development of an effective targeting mechanism is fundamental to FOFA. The means to attack the second echelon of the Soviet thrust either already exists in

the form of artillery and airpower or is close to deployment: terminally guided sub-munitions are an important example. However, FOFA is costly and the critical systems are American and beyond the European technical base to replicate. Inevitably there is the perception in Europe that adopting FOFA will mean buying yet more US weapons. Also in the US Congress, there are strong moves to reduce military expenditure now that events in Eastern Europe have reduced the possibility of an immediate Soviet attack. But while near term Soviet intentions may be benign, the Soviets remain, and in all probability will remain, a latent threat to the security of Europe. FOFA offers a way of reducing that threat. FOFA, or rather the critical elements of the concept, are expensive but are probably affordable even in today's military expenditure environment. Moreover, FOFA offers a way of developing and deploying the new systems which inevitably will result from new technologies in a coordinated fashion and, thus, avoid duplication of effort. The concept also should improve the effectiveness of existing systems by giving a framework for employing them in a more responsive and effective manner against the most critical target arrays. Further, the flexibility of the concept should mean that FOFA retains its utility against new Soviet tactics including OMGs but it is essential that sub-systems should be highly immune to Soviet countermeasures. The potency of FOFA makes it a deterrent to WP aggression. FOFA offers to make a considerable contribution to "fighting to win outnumbered" but much remains to be done if FOFA's full potential is to be achieved. Weapon procurement, training and doctrine

development all require further work but provided that these tasks can be properly developed, FOFA may hold the key to a viable defense of the Central Region.

RECOMMENDATIONS

18. NATO should continue to advocate the implementation of the FOFA concept. A sense of European involvement must be fostered. European industry should be encouraged to develop systems which contribute to FOFA but the critical elements are American and NATO leaders will have to lobby Congress to ensure that these are fielded. JSTARS is fundamental to FOFA and requires special attention. An optimum solution would be the formation of a multi-national NATO unit to operate JSTARS along the AWACS model. NATO also needs to continue to develop and refine procedures for the optimum employment of FOFA subsystems perhaps drawing on the US work on IFCs. There is also a need to maintain the momentum towards more lethal anti armor weapons for artillery and aircraft. None of these initiatives will be easy to implement but, perhaps, the most fundamental requirement is to continue to portray FOFA for what it is - a true force multiplier capable of making a vital contribution to the defense of Europe now and in the future.

1. Cited in "New Technology for NATO: Implementing FOFA." Congress of the United States: Office of Technology Assessment. 1987 pp. 15. Also Hamm, Manfred R. "The AirLand Battle Doctrine: NATO Strategy and Arms Control in Europe." Comparative Strategy. Volume 7, Number 3, 1988 highlights this dilemma on pp 195 and in endnote 49.
2. Ibid.
3. Ibid pp 17 gives a good summary of these doubts.
4. This contention is most strongly made in Steven Canby's "The Conventional Defense of Europe: the Operational Limits of Emerging Technology." Current News. September, 1985.
5. Lt Col John E Peters makes this point in his article "Evaluating FOFA as a Deterrent." published in the RUSI Journal Number 132, December 1987.
6. Several sources make this point notably:

"New Technology for NATO: Implementing FOFA." Congress of the United States: Office of Technology Assessment. Washington, 1987.

Sterling, Michael J. "Soviet Reactions to NATO's Emerging Technologies for Deep Attack." Rand Corporation. August, 1985.
7. These are identified in several documents including "New Technology for NATO: Implementing FOFA." Congress of the United States: Office of Technology Assessment. Washington, 1987.
8. This quote is cited in Donnelly, Christopher. "The Development of the Soviet Concept of Echeloning." NATO Review. Number 6, December, 1984. pp 9.
9. Canby, Steven L. "The Conventional Defense of Europe: The Operational Limits of Emerging Technology." Current News September 1985 pp 11.
10. Rogers, Bernard W., General, USA. "FOFA: Myth or Reality?" Military Technology. Volume 9, Number 3. 1985. pp. 29.
11. See "New Technology for NATO: Implementing FOFA." Congress of the United States: Office of Technology Assessment. Washington, 1987 and Blackwell, James A., Jr. "Status of Follow-On Forces Attack Technology" Military Technology. 10 October, 1988, pp. 115-116.

12. "New Technology for NATO: Implementing FOFA." Congress of the United States: Office of Technology Assessment. Washington, 1987. pp 146 -151.

13. ATARS is a generic development of sensors suitable for employment on drones or aircraft. In addition most countries in NATO's Central Region already have short range surveillance devices such as the UK Phoenix and Canadair CL 289.

14. This contention is supported by several sources notably Blackwell, James A., Jr. "Status of Follow-On Forces Attack Technology." Military Technology. 10 October, 1988, pp. 115-116. "New Technology for NATO: Implementing FOFA." Congress of the United States: Office of Technology Assessment. Washington, 1987. pp 146-151.

15. Quoted by a senior speaker to the Air War College Class of 90. The Air War College policy of non attribution dictates anonymity.

16. "Air Force Issues Book 1989." Department of the Air Force. 1989. pp 43.

17. Blackwell, James A., Jr. "Status of Follow-On Forces Attack Technology" Military Technology. 10 October, 1988, pp. 115-116.

18. The tasking cycle for more complicated missions can be as long as 12 hours although on-call CAS sorties can be mounted in a much more responsive manner. Indeed in some scenarios the aircraft are airborne and in-place only needing to be briefed before being in action (a response cycle of 10 minutes or so).

19. This already happens under such arrangements as the UK "Iron Spike" system where en route aircraft can be reallocated to new targets provided they have appropriate armament.

20. The author is aware but does not have access to US JCS publications including test publication 3-03 "Joint Interdiction of Follow-On Forces." which dictate the procedures for the targeting of Follow-On Forces. Similar documents will have to be agreed within the NATO aegis and are under development.

21. Typically out to 35 kilometers.

22. The US LANTIRN system is a good example of such a system. Other air forces such as the RAF plan to equip all attack and strike/attack aircraft with FLIR and night vision goggles.

23. Blackwell, James A., Jr. "Status of Follow-On Forces Attack Technology" Military Technology. 10 October, 1988, pp. 115-116. describes the weapon interface unit which would allow aircraft and missiles to receive target information in flight. This element of JSTARS has been canceled. Nevertheless, for aircraft, it should be possible to update them on target position just prior to attack.

24. The FLIR in such systems as the US LANTIRN and the UK night attack system cues pilots onto likely targets greatly increasing the probability of both finding a target and achieving a first pass attack. The systems processes the raw FLIR data and selects the shapes and temperature profiles most likely to be of interest on the particular mission. For example on an anti armor sortie the aircraft system indicates on the head up display probable tanks and armored personnel carriers. The pilot can then initiate weapon system aiming or allocation before visual or FLIR recognition of the target. Cueing increases both the probability of finding a target and attacking it successfully by an order of magnitude.

25. Figures such as one kill per pass are often quoted.

26. Mines on offer include the US GATOR and the UK HADES. In addition there are several so-called off-route mines under development. Such weapons are placed close to a road or track. They are equipped with sensors which not only allow the mine to detect the approach of armor but also direct the kill mechanism at the target. Some of these weapons can be air delivered.

27. A good example is the NATO collaborative development to give MLRS a terminally guided sub-munition under the terminally guided weapon (TGW) program. Such initiatives are said to give an order of magnitude increase in effectiveness.

28. "New Technology for NATO: Implementing FOFA." Congress of the United States: Office of Technology Assessment. Washington, 1987. 29-37.

29. For an excellent description of the background to, and features of, the OMG see Donnelly, Christopher. "The Development of the Soviet Concept of Echeloning." NATO Review. Number 6, December, 1984. The OMG concept was tested in the WP exercise "Zapad 81".

30. For a fuller description of OMGs see the Donnelly article cited in footnote 29 and also Rogers, Bernard W., General, USA. "Follow-on Force Attack (FOFA): Myths and Realities." NATO Review. Number 6, December, 1984. pp 2.

31. This description of the OMG modus operandi is contained in Canby, Steven L. "The Conventional Defense of Europe: the

Operational Limits of Emerging Technology." Current News. September, 1985, pp 11.

32. Ibid pp 12-16.

33. Donnelly, Christopher. "The Development of the Soviet Concept of Echelonning." NATO Review. Number 6, December, 1984. pp 16-17.

34. The Soviet experience in Manchuria is not relevant as at that stage of the war the Japanese lacked the mechanized forces to employ a fluid defense. Donnelly, Christopher. "The Development of the Soviet Concept of Echelonning." NATO Review. Number 6, December, 1984 pp 10 & 11 gives a good description of German tactics and the Soviet response.

35. Among other sources, Rogers, Bernard W., General, USA. "Follow-on Force Attack (FOFA): Myths and Realities." NATO Review. Number 6, December, 1984 pp 4 acknowledges this fact.

36. Walker, John, Air Vice Marshal, RAF. "The Conundrum of Air-Land Warfare." RUSI Journal. Summer, 1988 pp 21 gives a good description of a Soviet division on the move while Staudenmairer, William O., Colonel, USA. "Deep Strike in US and NATO Doctrine." Defense and Foreign Affairs. February 1987 gives a balanced view on the value of the second echelon in Soviet tactics.

37. In Rogers, Bernard W., General, USA. "Follow-on Force Attack (FOFA): Myths and Realities." NATO Review. Number 6, December, 1984 the former SACEUR suggests that although NATO's GDP forces should stop the first echelon, they have only a slim hope of stopping subsequent echelons.

38. In Rogers, Bernard W., General, USA. "Follow-on Force Attack (FOFA): Myths and Realities." NATO Review. Number 6, December, 1984 pp 4 the former SACEUR notes that "much of the new target detection and sensing capability we seek to acquire is necessary for us to identify which follow-on forces are organized as OMGs".

39. Canby, Steven L. "The Conventional Defense of Europe: the Operational Limits of Emerging Technology." Current News. September, 1985. pp 14-16.

40. Peters, John E., Lt Col, USA. "Evaluating FOFA as a Deterrent." RUSI. Number 132, December, 1987.

41. As cited in Stoecher, Sally. "Soviets plan countermeasures to FOFA." International Defense Review. 11/88. pp 1607.

42. Suggests Sterling, Michael J. "Soviet Reactions to NATO's Emerging Technologies for Deep Attack." Rand Corporation. August, 1985 and Stoecker, Sally. "Soviets plan Countermeasures to FOFA." International Defense Review. Number 11, 1988.

43. See Rogers, Bernard W., General, USA. "Follow-on Force Attack (FOFA): Myths and Realities." NATO Review. Number 6, December, 1984 pp 6. In addition, see Hamm, Manfred R. "The AirLand Battle Doctrine: NATO Strategy and Arms Control in Europe." Comparative Strategy. Volume 7, Number 3, 1988 pp 198 for an excellent description of the origin of these criticisms.

44. Staudenmairer, William O., Colonel, USA. "Deep Strike in US and NATO Doctrine." Defense and Foreign Affairs. February 1987 and Hamm, Manfred R. "The AirLand Battle Doctrine: NATO Strategy and Arms Control in Europe." Comparative Strategy. Volume 7, Number 3, 1988 pp 184 pp 196 agree with this contention.

45. See Staudenmairer, William O., Colonel, USA. "Deep Strike in US and NATO Doctrine." Defense and Foreign Affairs. February 1987 pp 29.

46. See Rogers, Bernard W., General, USA. "Follow-on Force Attack (FOFA): Myths and Realities." NATO Review. Number 6, December, 1984 pp 7.

47. These criticisms only apply to a few of the systems necessary for FOFA but they are the most expensive and critical and include JSTARS and some aspects of the IFCs.

48. From personal experience working in a major headquarters I know that this happens. For example in 2 ATAF there is an area which is US personnel only and while the sort of information which would emanate from the room would be most welcome in war (and also on major exercises) there is always the suspicion that in some circumstances it might not be released.

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